ART. 7. FOSSIL MAMMALS FROM MONTANA

Pt. 1. Additions to the Late Miocene Flint Creek Local Fauna

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Carnegie Museum field parties first under Earl Douglass and later under J. LeRoy Kay have made extensive collections from the Tertiary formations of southwestern Montana. Douglass reported on many of the early collections and later J. J. Burke (1935, 1936, 1938) described a number of rodents and rabbits obtained by these expeditions. Since Burke's work, however, a great many additional specimens have been added to these collections and much of this material adds appreciably to our knowledge of these faunas. This report is the first in a proposed series dealing with these collections.

The name Flint Creek Beds was originally proposed by Douglass (1903) for a series of beds exposed on the east side of Flint Creek along a bluff extending from just north to several miles south of the town of New Chicago, Granite County, Montana. Earlier (1900) he had described an oreodont from this deposit but did not use the term Flint Creek Beds at that time. In 1903 he listed the following species as having been collected from the Flint Creek Beds:

Ogmophis arenarum
Talpa? platybrachys
Sciurus
Mylagaulus paniensis
Aelurodon? brachygnathus
Protohippus?
Hesperhys vagrans
Merychyus smithi
Poatrephes paludicola
Merycochoerus laticeps
Procamelus
Palaeomeryx borealis

Later in the same paper he described many of these forms but did not again mention *Sciurus, Protohippus, Procamelus,* or *Palaeomeryx borealis.* In 1908, he described *Aphelops montanus* from these beds and in 1909, the *Palaeomeryx borealis* material placing it in a new genus, *Dromomeryx.* Since 1909, the fauna has not been restudied and three of the forms listed by Douglass (1903) as occurring in the fauna were never further described or discussed. Thorpe (1937) and Schultz and Falkenbach (1940 and 1941) reexamined the oreodont material. In the Guidebook for the Eighth Field Conference of the Society of Vertebrate Paleontology edited by R. W. Fields (1958) the following faunal list is given for the Flint Creek local fauna:

Ogmophis arenarum
Talpa platybrachys
Mylagaulus paniensis
Sciurus sp.
Aelurodon? brachygnathus
Parahippus sp.
Hypohippus sp.

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Merychippus insignis
Aphelops montanus
Poatrephes paludicola
Ticholeptus smithi
Meryocochoerus
Brachycrus laticeps
Procamelus sp.
Dromomeryx borealis
Merycodus sp.

Parahippus sp., *Hypohippus* sp., *Merychippus insignis,* and *Merycodus* sp. are recorded in this list for the first time and *Hesperhys vagrans* was omitted. Fields (1958, p. 33) states that unpublished lists of specimens from the Carnegie Museum collections were supplied by Dr. J. LeRoy Kay and used in the compilation of the faunal lists for the Guidebook. I would assume from this, and from the fact that, to my knowledge, no other work aside from that already mentioned has been published on the Flint Creek local fauna, that these additions listed under the Flint Creek local fauna were based on specimens in the Carnegie Museum collection.

Study of specimens in the Carnegie Museum collections make it necessary to revise this latest faunal list. There is no evidence for the occurrence of *Parahippus* in this fauna. *Hypohippus* and *Merychippus* are both present but the material is too fragmentary for specific identification. The presence of *Merycodus* is verified by C.M. 3345, a fragmentary right maxilla with M^1 and half of P^4. With the material described below, the species known to date from the Flint Creek local fauna are:

Ogmophis arenarum
Talpa? platybrachys
Hypolagus sp.
Mylagaulus paniensis
Citellus (Otospermophilus) primitivus
Monosaulax sp.
Cotimus alicae gen. et sp. nov.
Aelurodon brachygnathus
Hypohippus sp.
Merychippus sp.
Aphelops montanus
Hesperhys vagrans
Poatrephes paludicola
Ticholeptus zygomaticus smithi
Brachycrus laticeps
Procamelus sp.
Dromomeryx borealis
Merycodus sp.

The illustrations are by Mr. Clifford Morrow and were made possible by a grant from the Gulf Oil Corporation. All measurements are in millimeters. The following abbreviations are used:

C.M. Carnegie Museum
a-p anteroposterior
tr. transverse

Order Lagomorpha
Family Leporidae
Hypolagus sp.

Material. C.M. 3593, an isolated right upper molariform tooth and C.M. 13941, LP_3.

Description. These two specimens are of interest as they represent the first record for the Order Lagomorpha in this fauna. They are certainly assignable to *Hypolagus* but beyond that little can be said about their affinities. The hypostria of the upper molariform tooth is deep and markedly crenulate. The anteroexternal fold of P_3 is shallow while the posteroexternal fold is deep. The external face of P_3 is covered with cement.

Order Rodentia
Family Mylagaulidae
Mesogaulus paniensis (Matthew)
Figure 1

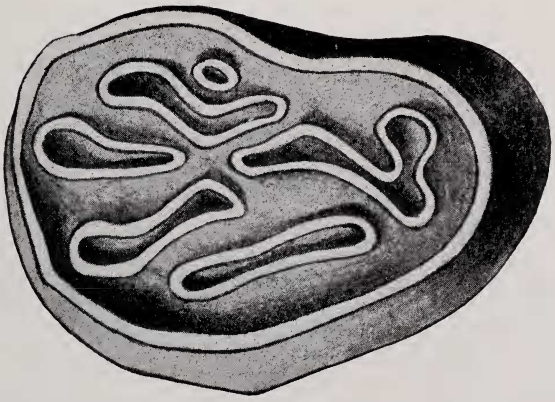

Fig. 1. *Mesogaulus paniensis,* C.M. 9564, RP^4 anterior end to right. $\times 10$

Material. C.M. 844, a partial right mandible with P_4 and M_2; C.M. 9564, RP^4; and C.M. 13594, RP^4.

Description. Douglass (1903, p. 172) referred a partial right mandible, C.M. 844 with P_4 and M_2 to *Mesogaulus paniensis.* At that time, he stated "There is one and only one prismatic molar, which was evidently persistent, as it is nearly or quite as high as the premolar. There is in this specimen no trace of a molar posterior to it." Though M_3 has been lost, or possibly shed, in this specimen, it was at one time certainly present. There is a large interdental wear surface on the posterior side of M_2 which clearly demonstrates that M_3 was present for at least part of the animal's life. Whether the tooth was shed during life or lost after death is unknown.

In addition to the partial mandible there are two upper premolars which have not previously been described for this species. Both teeth are well worn, one considerably more so than the other. There are five main fossettes with their long axes oriented anteroposteriorly. The anterior fossette is the longest with the four shorter ones grouped around it posteriorly. The anterior fossette at one stage of wear has a short arm directed buccally at right angles to the long axis of the tooth. With further wear this arm is separated from the main fossette as a small circular lake. There is a second small circular lake near the buccal margin of the tooth which is lost with wear. The entire outer surface of C.M. 13594 is covered by a thin layer of cement but there is no trace of cement on C.M. 9564. Deposition of cement appears to begin rather

late in the individual's life at least for species of *Mesogaulus*. In *M. novellus* cement occurs only near the base of the premolar crowns and only on well worn teeth, and no cement is present on the unworn premolars of *M. proximus* or *M. pristinus*.

Mesogaulus paniensis is larger than *M. ballensis* and *M. novellus* but there is little to distinguish it from *M. proximus* and *M. pristinus* from the Lower Madison Valley formation. A review of the species of *Mesogaulus* will be published at a later date and it is possible that these three species will be found to be synonymous.

Measurements

		a-p	tr.
C.M. 844	P_4	6.80	4.00
C.M. 844	M_2	3.00	3.20
C.M. 9564	P^4	7.20	5.20
C.M. 13594	P^4	7.20	4.80

Family Sciuridae

Citellus (Otospermophilus) primitivus Bryant

Material. C.M. 727, a badly crushed and damaged skull and jaws.

Description. A detailed description and comparison of this material with *Citellus (O.) primitivus* from the Lower Madison Valley formation is in progress in connection with a review of North American Tertiary squirrels. The material from Flint Creek resembles that of the type where comparable and there is little doubt but that it represents the same species.

Family Castoridae

Monosaulax sp.

Figure 2

Fig. 2. *Monosaulax* sp. C.M. 8722, RP_4-M_2, anterior end to right. ×10

Material. C.M. 8722, a partial right mandible with P_4-M_2.

Description. The teeth are only moderately worn with the mesofossettid closed on M_1 and M_2 but still open on P_4. The hypostriids on P_4-M_2 are long and very deep. There are three primary fossettids on M_1 and M_2 and on M_2 there are also two small fossettids, one on either side of the anterior fossettid. These would both be quickly obliterated with further wear.

Discussion. The teeth of this specimen are considerably larger and higher crowned than *Monosaulax* sp. cf. *M. hesperus* from the Deep River local fauna (Black, 1961). Whatever the specific assignment of these two specimens may ultimately prove to be, the Flint Creek species is certainly more advanced than that from Deep River.

Measurements

	a-p	tr.
P_4	5.20	4.40
M_1	3.50	4.20
M_2	3.60	4.30

Family Cricetidae
Tribe Eumyini
*Cotimus** gen. nov.

Type. Cotimus alicae† sp. nov.

Diagnosis. Mandible slender, more delicate than in *Eumys, Scottimus,* or *Leidymys;* three crests passing from anterior cingulum to protoconid and metaconid, on M_1; posterior protoconid arm passes to base of entoconid on M_2 reaches lingual border on M_3; molars decrease in length from M_1 to M_3.

Cotimus alicae sp. nov.
Figure 3

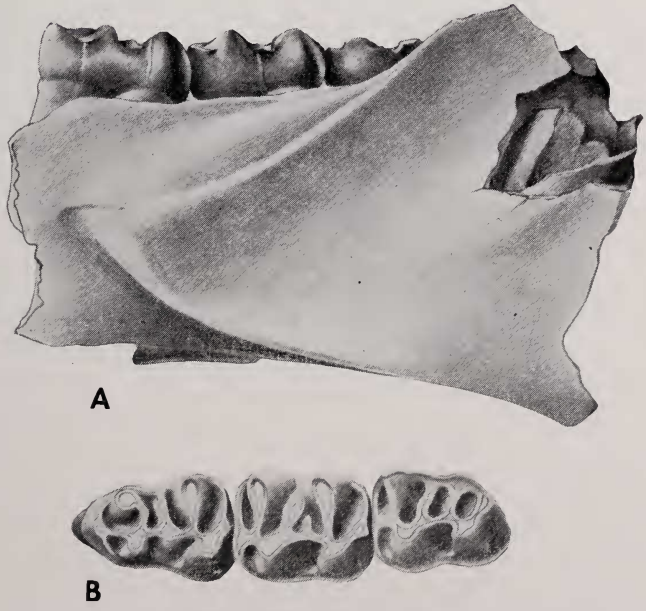

Fig. 3. *Cotimus alicae* gen. et. sp. nov. Type, C.M. 8868
A. Lateral view of left mandible. ×10. B. LM_1-M_2, anterior end to left. ×15

Type. C.M. 8868, partial left ramus with M_1-M_3.

Diagnosis. As for the genus.

Description. The mandible is slender and shallow. The dorsal masseteric crest terminates anteriorly in a prominent shelf below the center of M_1.

*From *cos, cotis* Latin, flintstone and *mus* Latin, mouse.
†Named for Alice Guilday who collected the specimen.

Inferiorly the masseteric fossa is set off by a strong, raised border, while there is a shallow furrow above the dorsal masseteric crest.

All of the cheek teeth are low crowned. They decrease in length from M_1 to M_3. The anteroconid on M_1 is large and strongly connected to the metaconid. Buccally there is a crest from the anteroconid to the protoconid. The anterior protoconid arm passes from the protoconid directly forward to join the anteroconid. These three crests, in conjunction with the strong posterior protoconid arm passing to the metaconid, isolate two rather deep pits in the anterior portion of the tooth. Behind the posterior protoconid arm a strong mesolophid passes to the lingual border of the tooth where it is joined by a crest passing along the lingual border from the metaconid. The mesoconid is large on M_1, much more so than on M_2 or M_3. A short anterior hypoconid arm passes to the entoconid. There is a small hypoconulid and strong posterior cingulum which meets the entoconid at its posterolingual corner. The buccal valley between the protoconid and entoconid is broad. On M_2 the anterior cingulum is well developed both internally and externally. The protoconid and metaconid are joined through the anterior protoconid arm. The posterior protoconid arm passes across the tooth to the base of the entoconid, failing to reach the lingual margin. A short mesolophid is present between the posterior protoconid arm and the anterior hypoconid arm. The latter passes almost directly across the tooth to the entoconid. The hypoconulid and posterior cingulum on M_2 resemble those on M_1. The buccal valley is constructed, curving posteriorly, and there is a small stylid at the base of the protoconid. M_3, although reduced in size, is similar in most respects to M_2. However, the posterior protoconid arm reaches the lingual border and the hypoconid-hypoconulid are expanded.

	Measurements	
	a-p	tr.
M_1	2.00	1.15 - 1.45
M_2	1.80	1.60 - 1.65
M_3	1.70	1.40 - 1.20

Discussion. There is little resemblance between *Cotimus* and Tertiary members of the cricetid Tribe Hesperomyini. *Michomys* (Hoffmeister, 1959, p. 697) from the Sante Fe formation appears to be a true hesperomyine and is probably closely related to *Peromyscus*. *Cotimus* differs from these forms in showing no alteration of major cusps, strong protoconid arms, and a complexly crested anterior half of M_1.

The affinities of this genus are with the eumyine cricetids which were so abundant during the Oligocene but are rare elements in Miocene faunas. *Copemys* (Wood, 1936) from the Sante Fe, while probably an eumyine, differs strikingly from *Cotimus*. The isolated metaconid on M_1, partial alternation of major cusps, and peculiar position of the posterior cingulum on M_2 are all quite in contrast to the condition of *Cotimus*.

Cotimus is much closer to the Oligocene *Eumys* than to any other genus known to date and it seems to be closer to the plains *Eumys* complex than to the intermontaine species of that genus. White (1954, p. 410) has pointed out that the intermontaine species of *Eumys* tends to be larger, more robust, and with higher crowned teeth than their contemporaries on the plains. However, *Cotimus*, although an intermontaine form, is much more reminiscent of the plains species as regards its slender, delicate mandible and small, low-crowned teeth.

M_1 of *Cotimus alicae* shows some resemblance to that of *Cricetodon nebraskensis* (Wood, 1937, p. 256) especially in the development of the mesolophid. The second molar, however, bears little resemblance to that of *Cricetodon nebraskensis*. Galbreath (1953, p. 69) in discussing the *Eumys* complex from the Oligocene of Northeastern Colorado pointed out that *Cricetodon nebraskensis* Wood falls within the normal variation of the *Eumys obliquidens* population from the Cedar Creek member of the White River formation and hence is quite possibly conspecific with *E. obliquidens*. In many respects *Cotimus alicae* and *Eumys obliquidens* appear to be rather closely allied. In both species the posterior protoconid arms turn postero-mesiad on M_2 and M_3 either uniting with the entoconids or passing to the lingual margin. In both species the mesolophid on M_1 is longer than the posterior protoconid arm. However, Galbreath states (1953, p. 67-71) that in all samples of *Eumys* from the later Oligocene deposits of Northeastern Colorado there appears to be a trend towards the loss of the mesolophid on M_1, the displacement of the posterior protoconid arm anteriorly to unite with the metaconid on M_2-M_3, and a reduction of the lingual portion of the anterior cingulum. These changes are all trending away from the condition seen in *Cotimus alicae*.

It would appear, therefore, that the most likely ancestral condition for *Cotimus* is that seen in the early mid-Oligocene populations of *E. obliquidens*. The changes that took place between the middle Oligocene and late Miocene were a strengthening of the mesolophid on M_1, a continued emphasis on the postero-mesiad development of the posterior protoconid arm on M_2 and M_3 with a consequent reduction in the importance of the mesolophid, a trend towards complication of the crests passing to the anterior cingulum, and a decrease in overall size and robustness of the mandible.

AGE OF THE FAUNA

Wood, et al. (1941) placed the age of the Flint Creek local fauna as early Barstovian, probably equivalent to the Deep River local fauna. The rodents from Flint Creek are, however, somewhat more advanced than those known from Deep River and agree much more closely with those from the Lower Madison Valley formation. *Mesogaulus paniensis* has higher crowned teeth and is larger than *M. ballensis* of the Deep River but it can scarcely be separated from *M. proximus* and *M. pristinus* of the Lower Madison Valley. *Citellus (Otospermophilus) primitivus* occurs in both the Flint Creek and Lower Madison Valley faunas but is unknown from the Deep River. The beaver is advanced over that from the Deep River being both larger and having higher crowned teeth. From this it appears obvious that the Flint Creek local fauna and the Deep River local fauna are not of equivalent age but that the Flint Creek local fauna is younger, probably middle to late Barstovian in age and quite probably equivalent to part of the Lower Madison Valley fauna.

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